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DINOSAURS!

•DISCOVER THE GIANTS OF THE PRE IC WORLD•

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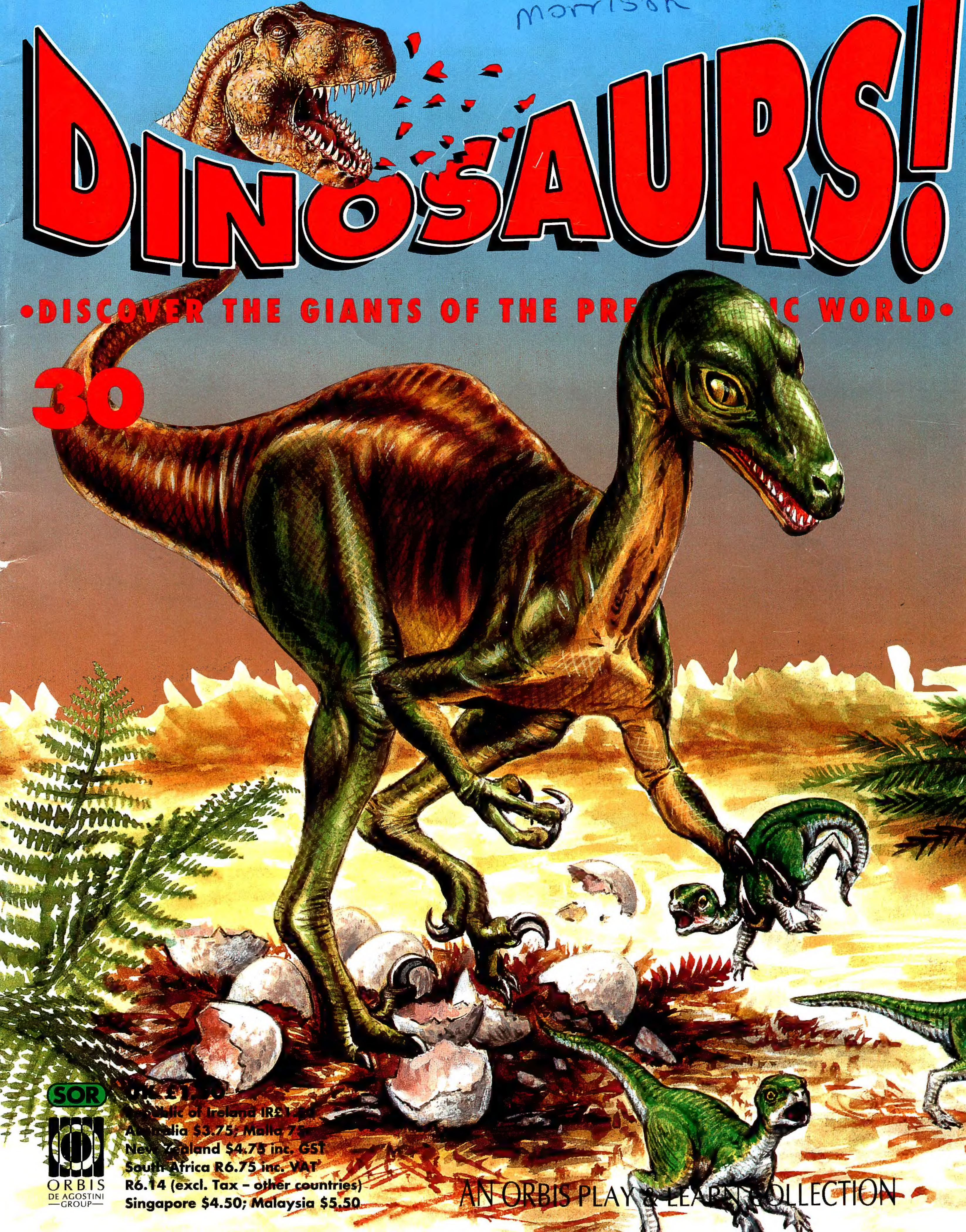

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DINOSAURS!

• DISCOVER THE GIANTS OF THE PREHISTORIC WORLD •

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All you ever wanted to know about

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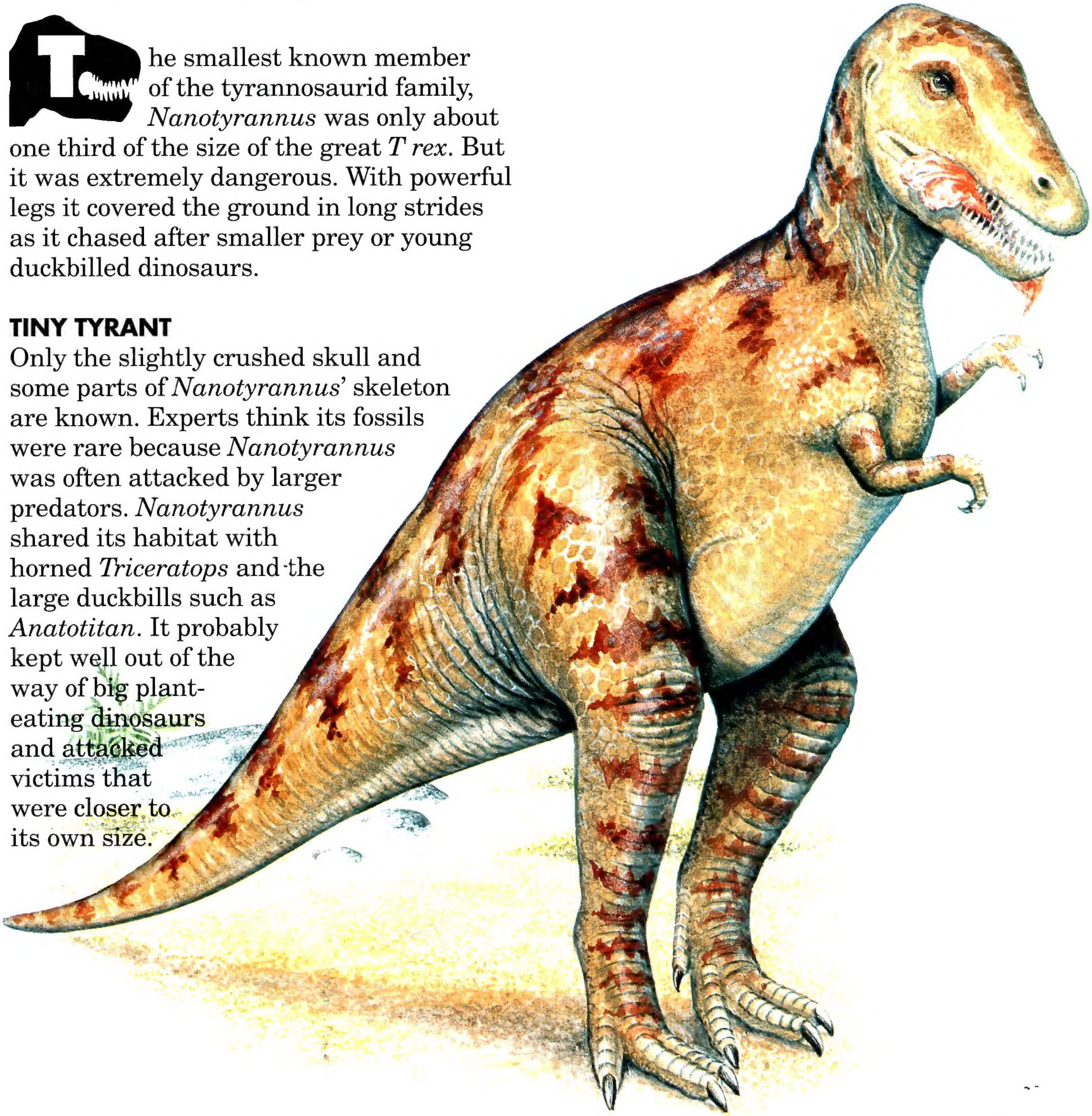
NANOTYRANNUS

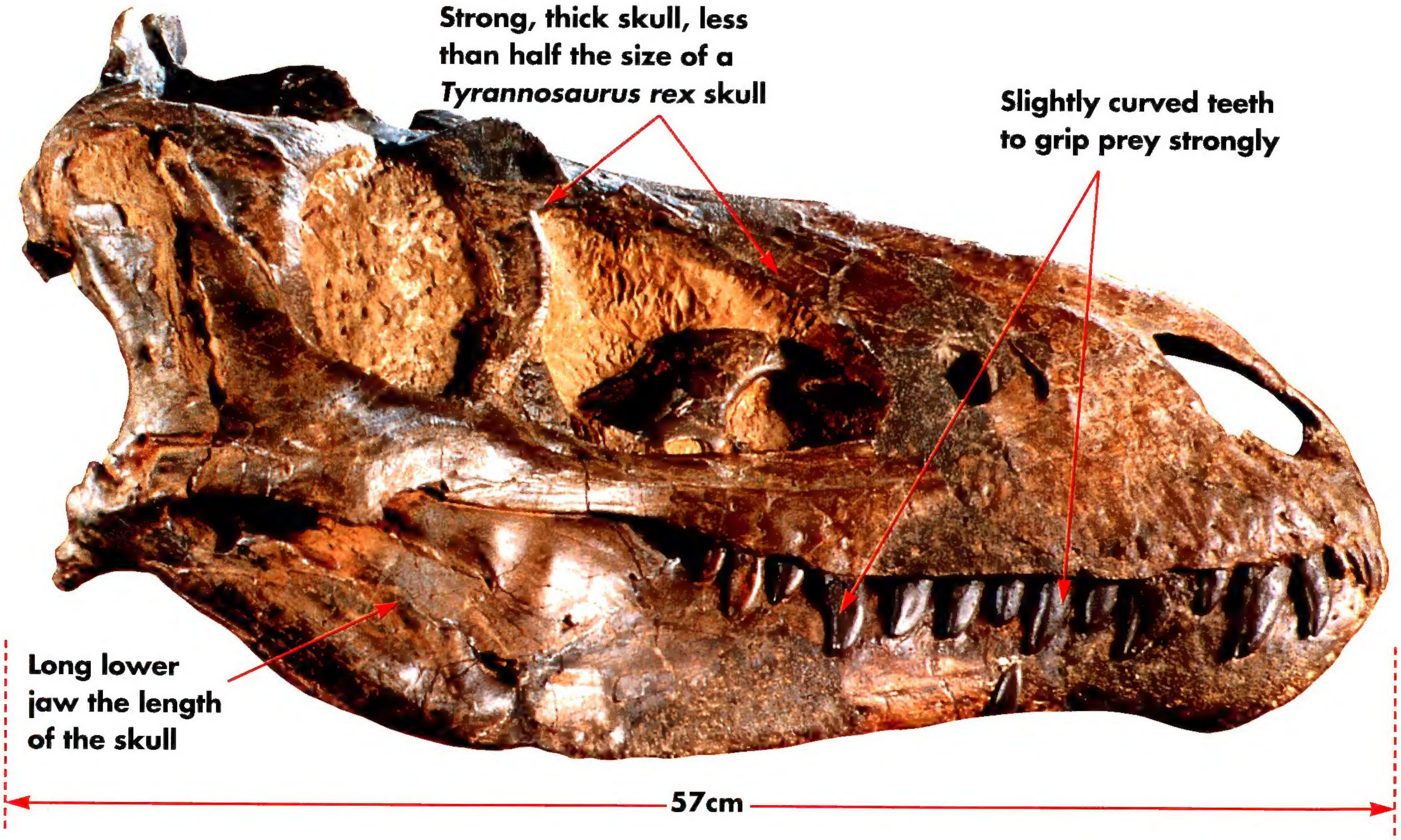
Ferocious *Nanotyrannus* looked like a dwarf *T rex,* but was much more agile than its larger cousin.

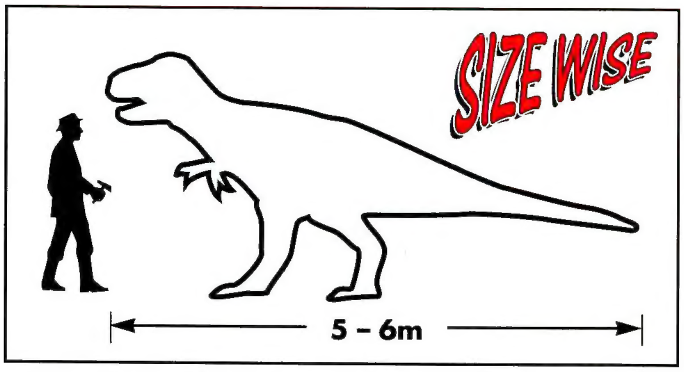
The smallest known member of the tyrannosaurid family, *Nanotyrannus* was only about one third of the size of the great *T rex*. But it was extremely dangerous. With powerful legs it covered the ground in long strides as it chased after smaller prey or young duckbilled dinosaurs.

TINY TYRANT

Only the slightly crushed skull and some parts of *Nanotyrannus*' skeleton are known. Experts think its fossils were rare because *Nanotyrannus* was often attacked by larger predators. *Nanotyrannus* shared its habitat with horned *Triceratops* and the large duckbills such as *Anatotitan*. It probably kept well out of the way of big plant-eating dinosaurs and attacked victims that were closer to its own size.




Strong, thick skull, less than half the size of a *Tyrannosaurus rex* skull
Slightly curved teeth to grip prey strongly
Long lower jaw the length of the skull
57cm



MONSTER FACTS

- **NAME:** *Nanotyrannus* (nan-oh-ty-ran-nus) means 'tiny tyrant'
- **SIZE:** about 5 – 6m long
- **FOOD:** meat, probably young dinosaurs or carrion (dead animals)
- **LIVED:** about 75 million years ago in the Late Cretaceous Period in Montana, USA

POWERFUL JAW

Nanotyrannus had a head about as long as an adult human's arm. The lower jaw stretched along the whole length of its skull. Powerful muscles ran from behind its eye to the back of the jaw.

FRONT-FACING EYES

Nanotyrannus had large eyes which faced forwards above its long, low snout. Face to face, it must have been a terrifying sight to its victims, with its beady stare and enormous jaws.

FAST RUNNER

Nanotyrannus weighed a lot less than its larger cousins – about 500kg, which is less than half the weight of a hippopotamus. Compared with its heavyweight relatives, *Nanotyrannus* was quite an agile dinosaur. It was able to get out of tight corners and make a fast escape on strong, sturdy legs. Scientists think that *Nanotyrannus* may have been able to run at up to 30km/h in short bursts.

MEAT-LOVER

Nanotyrannus was as long as two lions and had a lion's love of meat. It probably attacked its prey from behind with its great jaws gaping. Its powerful neck took the full force of the impact as *Nanotyrannus* sank its curved fangs deep into its surprised victim's body.

Like a lion today (left), *Nanotyrannus* would have devoured its victim's carcass in huge bites.

Is it true that tyrannosaurs used their arms as props?

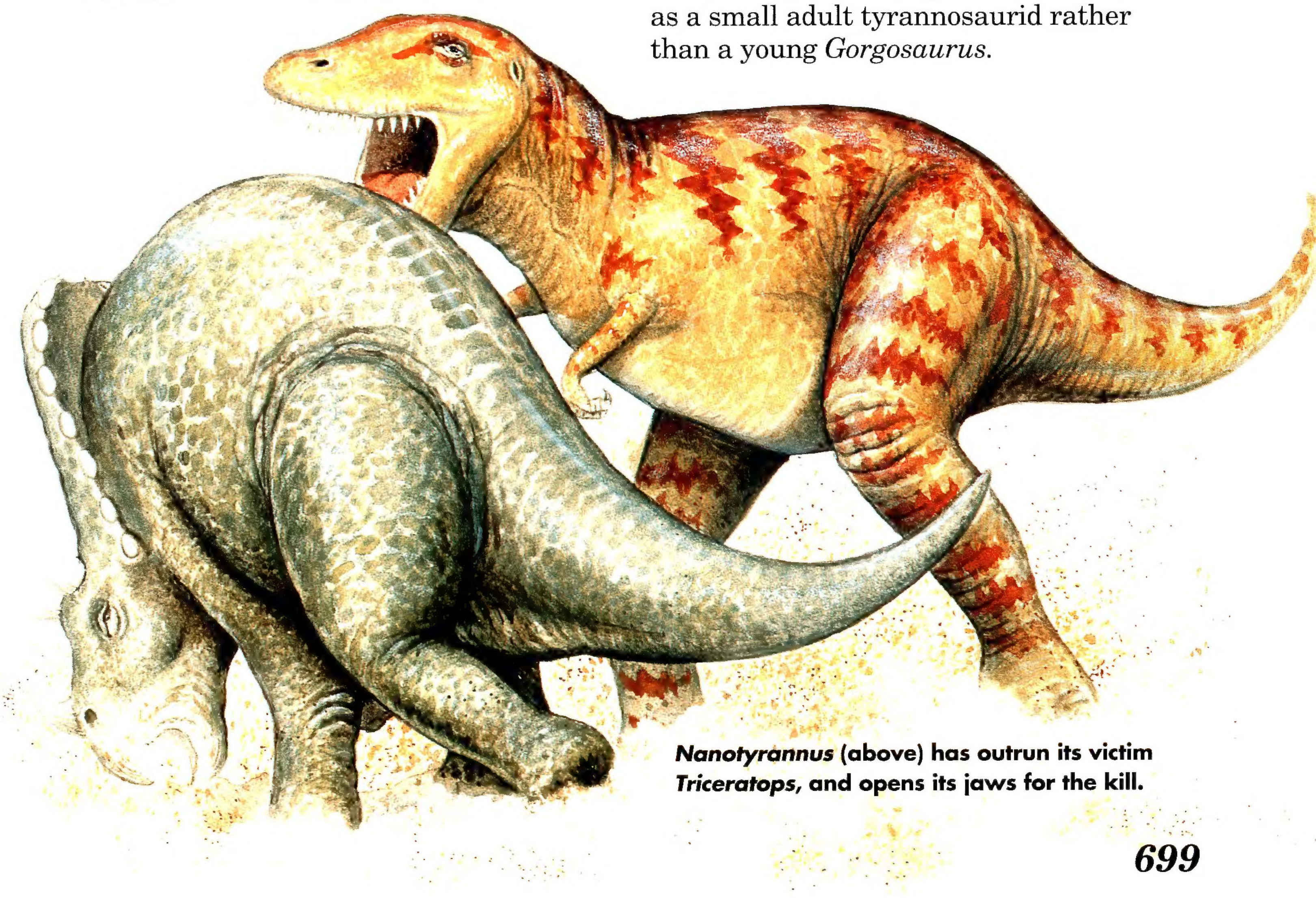
Yes. Scientists think that tyrannosaurs probably used their feeble arms as props to help them get up from the ground. By supporting the front of its body with its arms, a tyrannosaur could straighten its muscular back legs. Then it tilted its body so that it was standing upright.

MINI ARMS

Like other tyrannosaurs, *Nanotyrannus* had tiny arms. At the end of each arm there were two clawed fingers.

NAME CHANGE

Nanotyrannus was once known as *Gorgosaurus*. It was renamed in 1988 when two palaeontologists identified it as a small adult tyrannosaurid rather than a young *Gorgosaurus*.



***Nanotyrannus* (above) has outrun its victim *Triceratops*, and opens its jaws for the kill.**

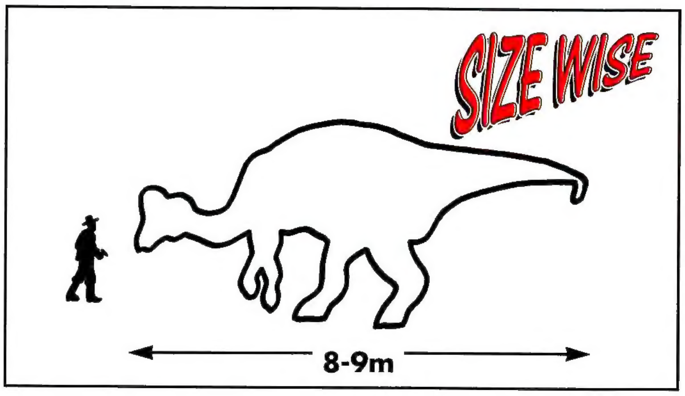
JAXARTOSAURUS

***Jaxartosaurus* had a head crest like *Corythosaurus*, but it was smaller and shorter, and shaped more like a saucer than a dinner plate.**

Very little is known about this hadrosaur because only the roof of its skull has been found. Scientists think it had a lifestyle similar to other crested hadrosaurs.

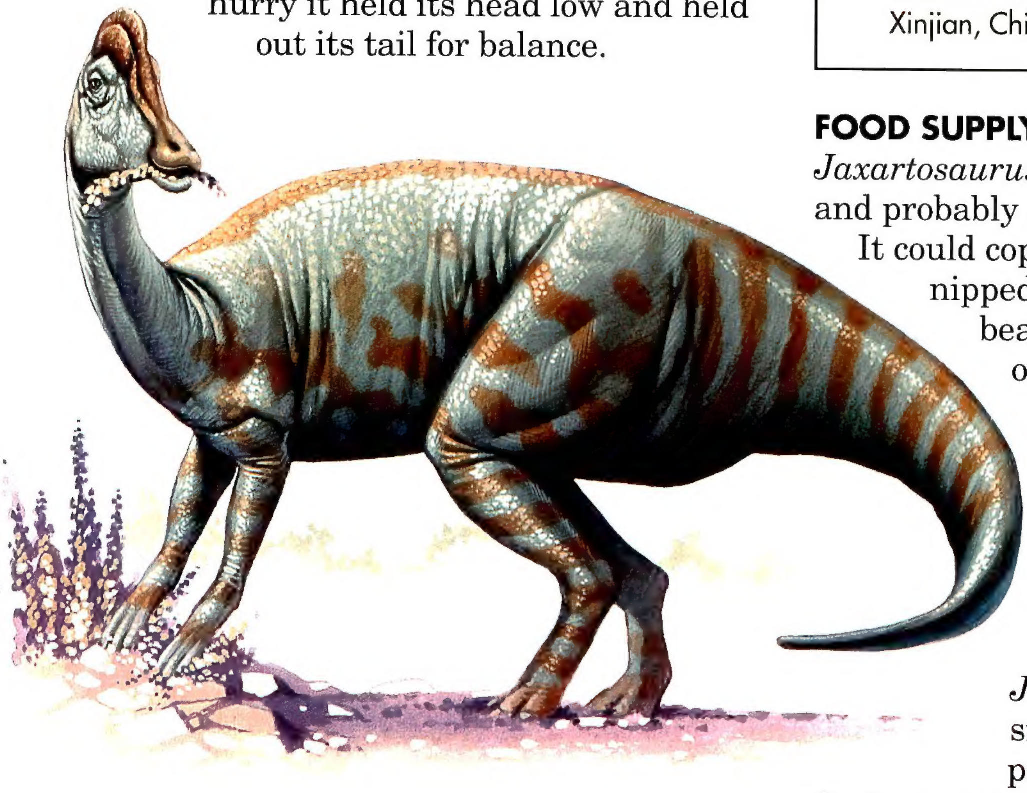
ALERT BROWSER

As it browsed among low-growing plants, *Jaxartosaurus* probably stood on all fours. Its sharp senses warned it of danger. If it spotted a moving shadow or heard the slightest sound *Jaxartosaurus* loped off on its strong back legs. When it was in a hurry it held its head low and held out its tail for balance.



MONSTER FACTS

- **NAME:** *Jaxartosaurus* (jaks-art-oh-saw-rus) means 'Jaxartes reptile'
- **SIZE:** about 8 – 9m long
- **FOOD:** plants
- **LIVE:** about 90 million years ago in the Late Cretaceous Period in Kazakhstan, Russia and Xinjian, China



FOOD SUPPLY

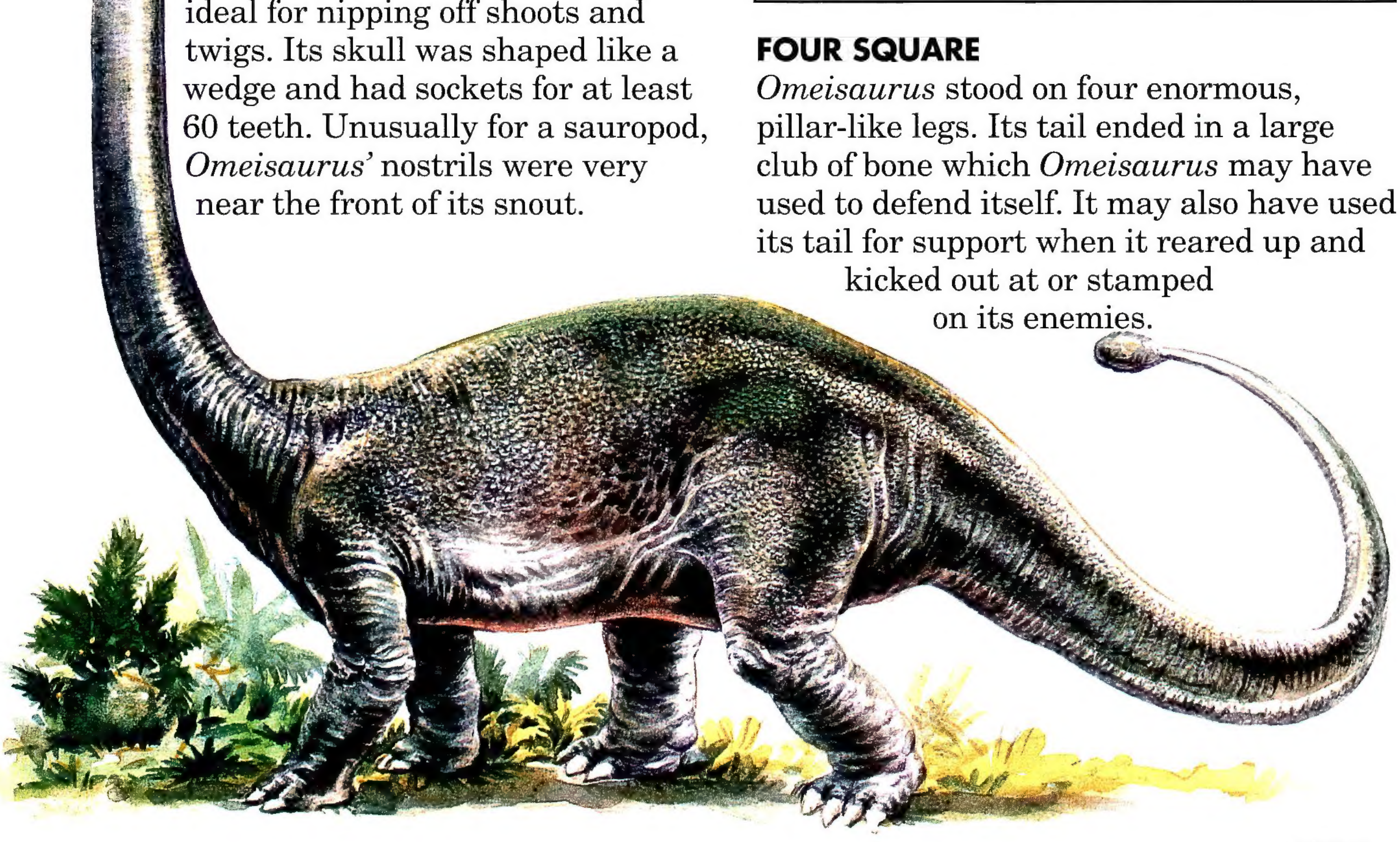
Jaxartosaurus was longer than an elephant and probably spent most of its time eating. It could cope with tough vegetation, and nipped off shoots with its toothless beak. Chewing was done by rows of cheek teeth, which ground plants and twigs to a mushy pulp before *Jaxartosaurus* swallowed them.

SMALL CREST

By contrast with some of the other hadrosaurs, *Jaxartosaurus* had quite a small, low crest. It was probably used as a calling device to attract females or warn of danger.

OMEISAURUS

Omeisaurus was as long as two double-decker buses standing bumper to bumper.



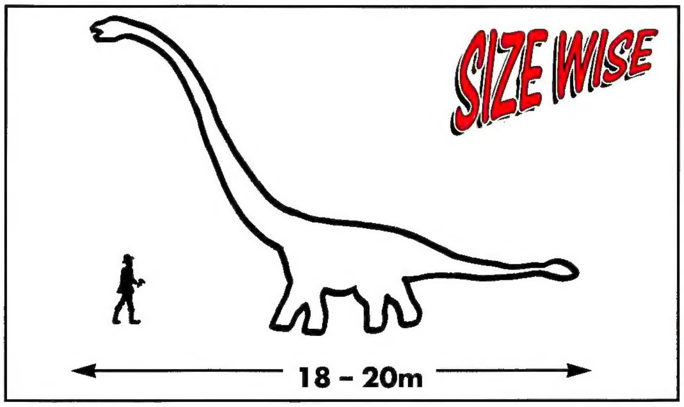
Omeisaurus was a sauropod, the heaviest and tallest family of dinosaurs. Its enormous neck and tail stretched out in front and behind its bulky body. *Omeisaurus* ate plants and had the choice of the most succulent shoots that shorter rivals could not reach. It poked among the branches with its short, deep head.

BLUNT TEETH

Omeisaurus had thick, blunt, chisel-shaped teeth which were ideal for nipping off shoots and twigs. Its skull was shaped like a wedge and had sockets for at least 60 teeth. Unusually for a sauropod, *Omeisaurus'* nostrils were very near the front of its snout.

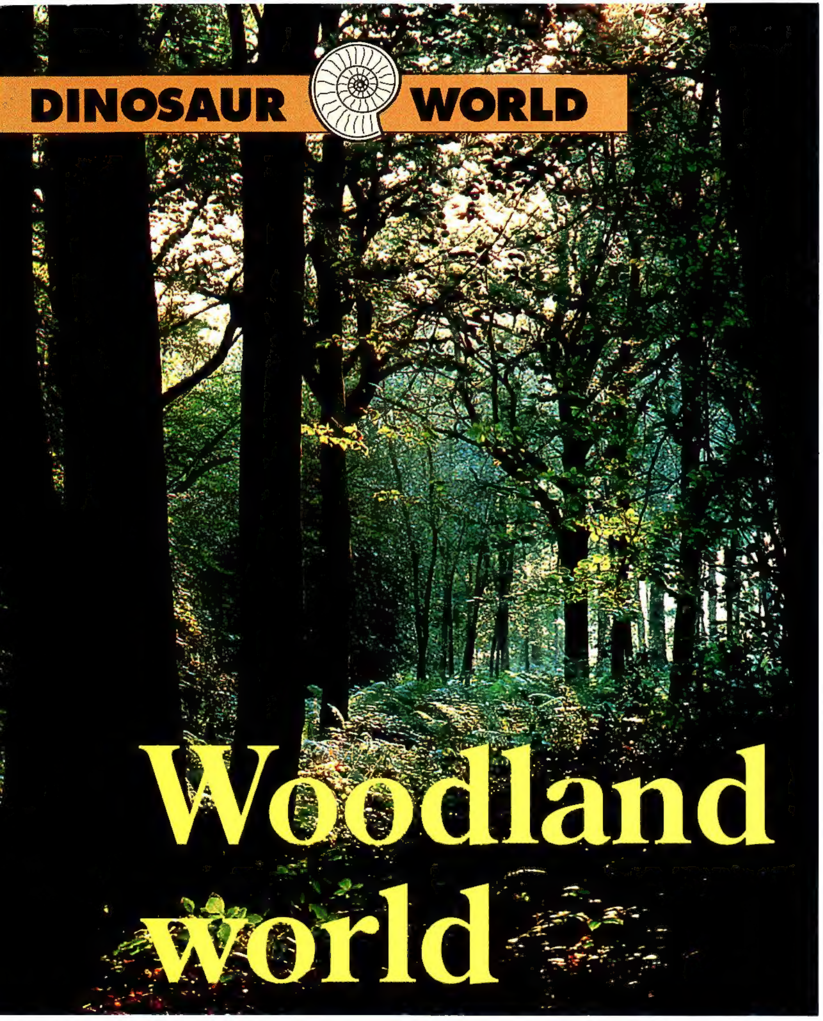
MONSTER FACTS

- **NAME:** *Omeisaurus* (om-i-saw-rus) means 'Omei reptile' as it was found near Mount Omei
- **SIZE:** 18 – 20m long
- **FOOD:** plants
- **LIVED :** about 150 million years ago in the Late Jurassic Period in Sichuan, China



FOUR SQUARE

Omeisaurus stood on four enormous, pillar-like legs. Its tail ended in a large club of bone which *Omeisaurus* may have used to defend itself. It may also have used its tail for support when it reared up and kicked out at or stamped on its enemies.



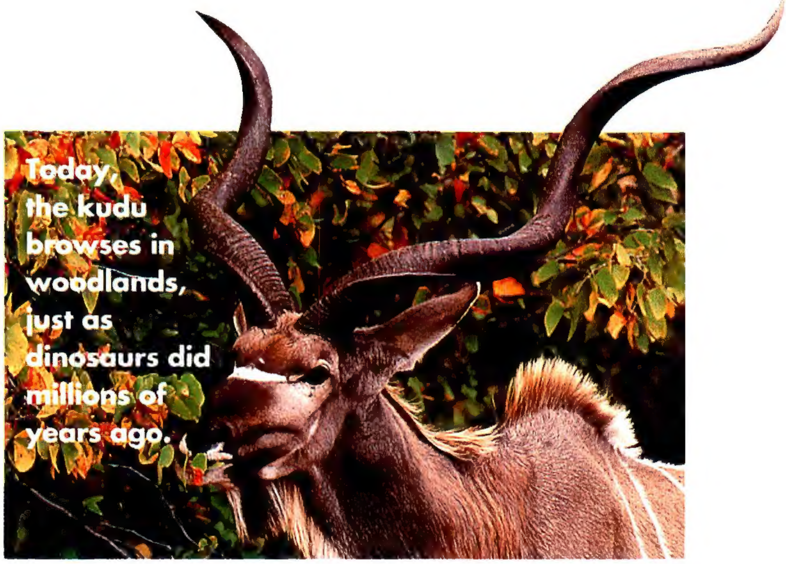
Woodland world

Dinosaurs found shade, shelter, food and drink in the prehistoric woodlands millions of years ago.

If you were a wild animal, where would you live? A woodland might be best. Trees keep off the sun, wind, rain and snow. You can cool off in the shade, or warm up in a sunny clearing. There are places to shelter or hide. There are leaves, flowers, fruits, nuts and berries to eat. And there are pools and streams for drinking and washing. Today, many animals live in woodlands and forests just as dinosaurs did millions of years ago.

WOODLAND FOSSILS

Scientists believe that some dinosaurs lived in woodlands because their fossils have been found alongside the fossils of leaves and trees, and the remains of other woodland creatures.



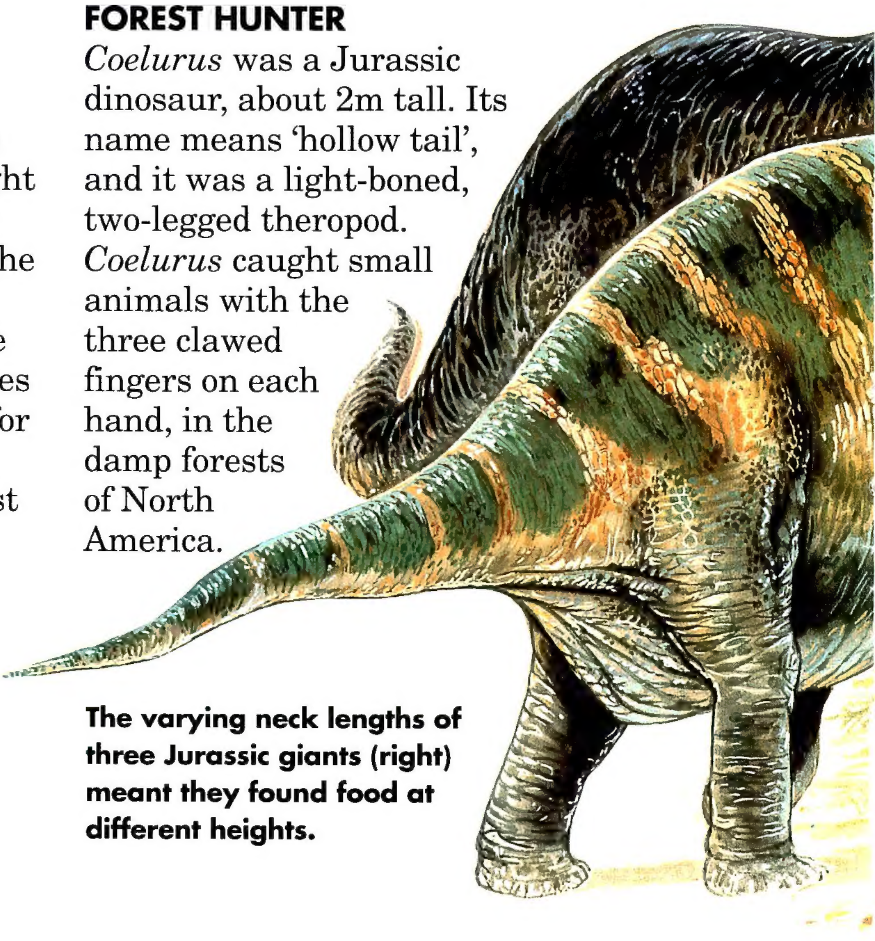
Today, the kudu browses in woodlands, just as dinosaurs did millions of years ago.

PREHISTORIC WOODLANDS

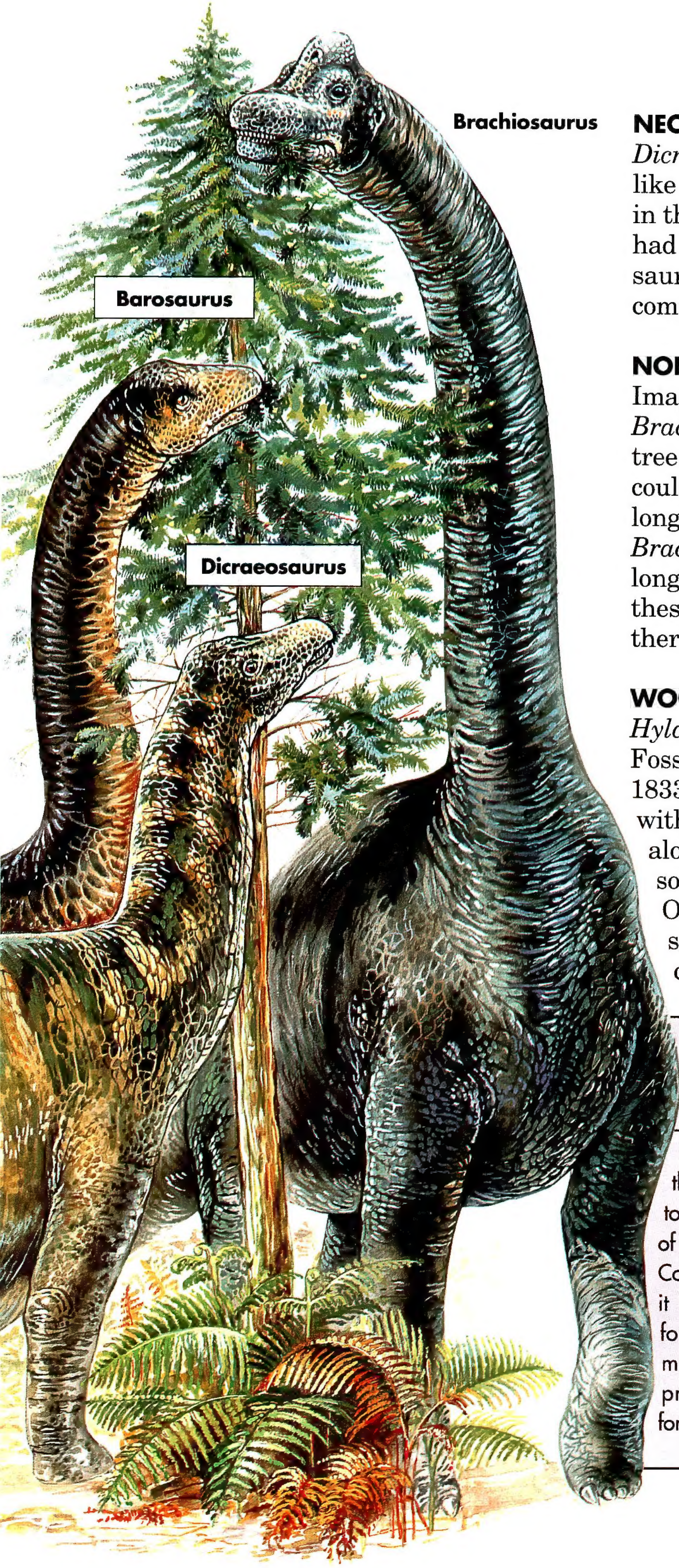
Woodlands came and went during the Age of the Dinosaurs. The Triassic was warm and dry, so thick forests were rare. The climate was wetter in the Jurassic, and tropical woodlands spread. Much coal was formed during this time. During the Cretaceous, a great deal of the land was flooded. Forests became wooded marshes, and many dinosaurs lived in a patchwork of dry woods and wet swamps.

FOREST HUNTER

Coelurus was a Jurassic dinosaur, about 2m tall. Its name means 'hollow tail', and it was a light-boned, two-legged theropod. *Coelurus* caught small animals with the three clawed fingers on each hand, in the damp forests of North America.



The varying neck lengths of three Jurassic giants (right) meant they found food at different heights.



NECK AND NECK

Dicraeosaurus was a sauropod dinosaur, like *Diplodocus*. It lived in southern Africa in the Jurassic. But it was smaller, and had a shorter neck and tail than most sauropods. This may have been to avoid competition with its cousins.

NON-COMPETING COUSINS?

Imagine *Dicraeosaurus*, *Barosaurus* and *Brachiosaurus* browsing on the leaves of a tree. *Dicraeosaurus* had a short neck and could only reach up 6-7m. *Barosaurus*' longer neck allowed it to reach up 8-9m. *Brachiosaurus*, with a long neck and very long front legs, could reach up to 11m. So these dinosaurs ate at different levels, and there was food for all.

WOODLAND DINOSAUR

Hylaeosaurus means 'woodland reptile'. Fossils of this dinosaur were discovered in 1833. It was a nodosaur, or 'lumpy reptile', with hard, bony knobs and thick spines along its back. *Hylaeosaurus* lived in southern England in the Cretaceous. Only the front half of the skeleton survived, and this has never been completely removed from the rock.

What is? JURASSIC COAL

It is coal formed during the Jurassic Period. In the warm, damp forests plants and trees rotted to form peat. The peat was buried. Over millions of years it changed to a black, shiny rock – coal. Coal is fossilized leaves and wood, which is why it burns well. The main period when coal was formed was the Carboniferous, more than 80 million years before the Jurassic. But Jurassic coal proves that there must have been abundant forests for dinosaurs of the time.

THE HALF-PLATE HEADS

Corythosaurus was a very large duckbilled dinosaur. It lived in Alberta and Montana, USA, in the Late Cretaceous. Fossils of *Corythosaurus*' stomach contents show that it fed on magnolia leaves, pine needles, seeds and fruit. So it's a good bet that it was a woodland-dweller. *Corythosaurus* also had a strange rounded crest about 30cm high, like half a dinner plate, on its head. Why?

TALKING THROUGH TREES

This hollow crest probably helped the dinosaur to make loud, foghorn-like calls. Many forest animals today make loud noises, as they cannot see each other through the dense forest. They call to keep in touch with their group, or to warn away enemies. The howler monkey howls incredibly loudly, using its large throat pouch. *Corythosaurus* may have called to its herd among the trees.

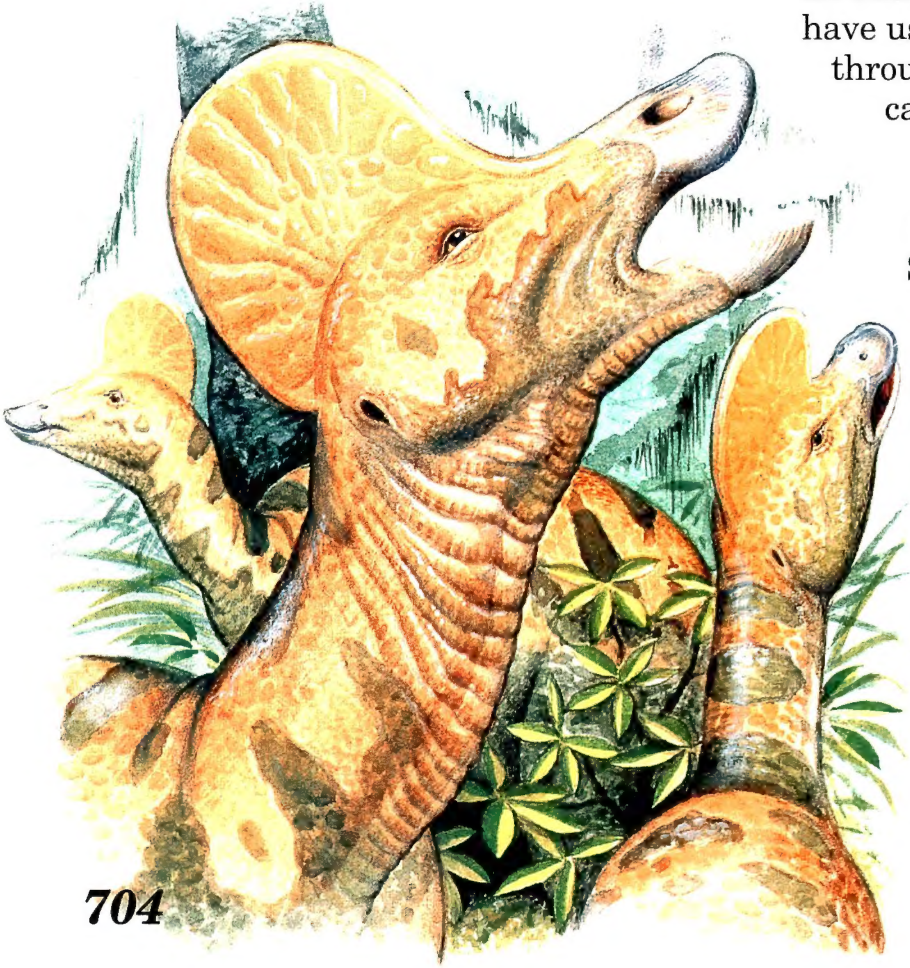
An open-mouthed howler monkey uses its large throat pouch to make its call ring noisily through the forest.

PUSHING THROUGH UNDERGROWTH

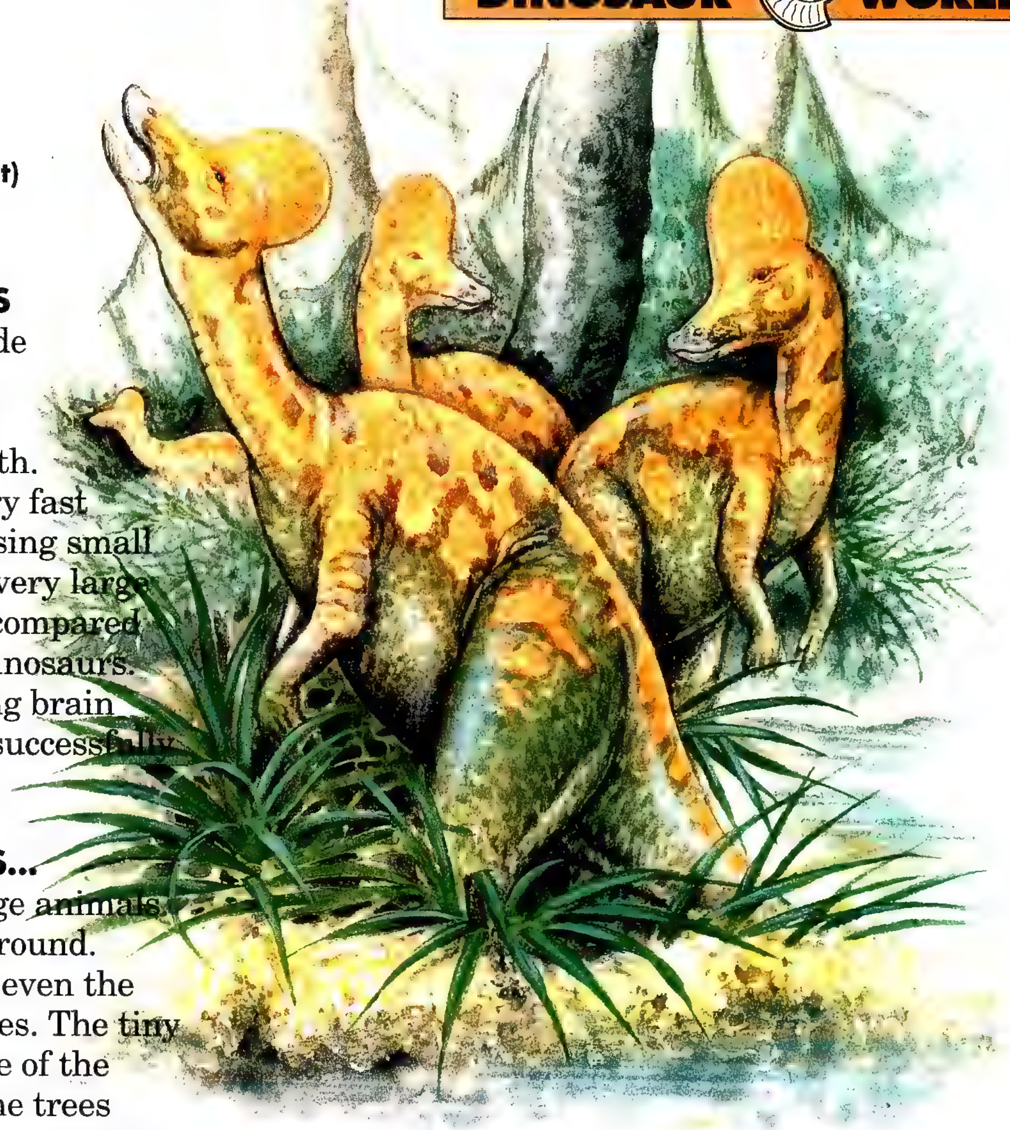
Parasaurolophus was another duckbilled dinosaur that lived in the Cretaceous forests of North America. The crest on the back of its head was 2m long – longer than an adult human! *Parasaurolophus* may have used its crest like a helmet to push through the dense undergrowth. The cassowary, an Australian forest bird, uses its crest like this today.

BRIGHT FLAGS

Scientists think that hadrosaurs lived in groups or herds. Their crests may have been covered with brightly coloured skin and scales. These may have been used like bright flags, to send visual signals through the trees to their mates and rivals. Only very bright colours would show up in the forest shade.



In the depths of a Cretaceous forest, a *Corythosaurus* (left) calls loudly to keep in touch with distant members of its herd.



Some distance away, another member of the *Corythosaurus* herd (right) answers the call.

BIG EYES FOR SHADY WOODS

Dromiceiomimus lived alongside the American duckbilled dinosaurs. It was an ostrich dinosaur with a beak-like mouth. *Dromiceiomimus* could run very fast on its long, slim back legs, chasing small mammals and reptiles. It had very large eyes and a much bigger brain compared with its body size than other dinosaurs. The big eyes and quick-thinking brain may have helped it hunt prey successfully as darkness fell in the forest.

MEANWHILE, UP IN THE TREES...

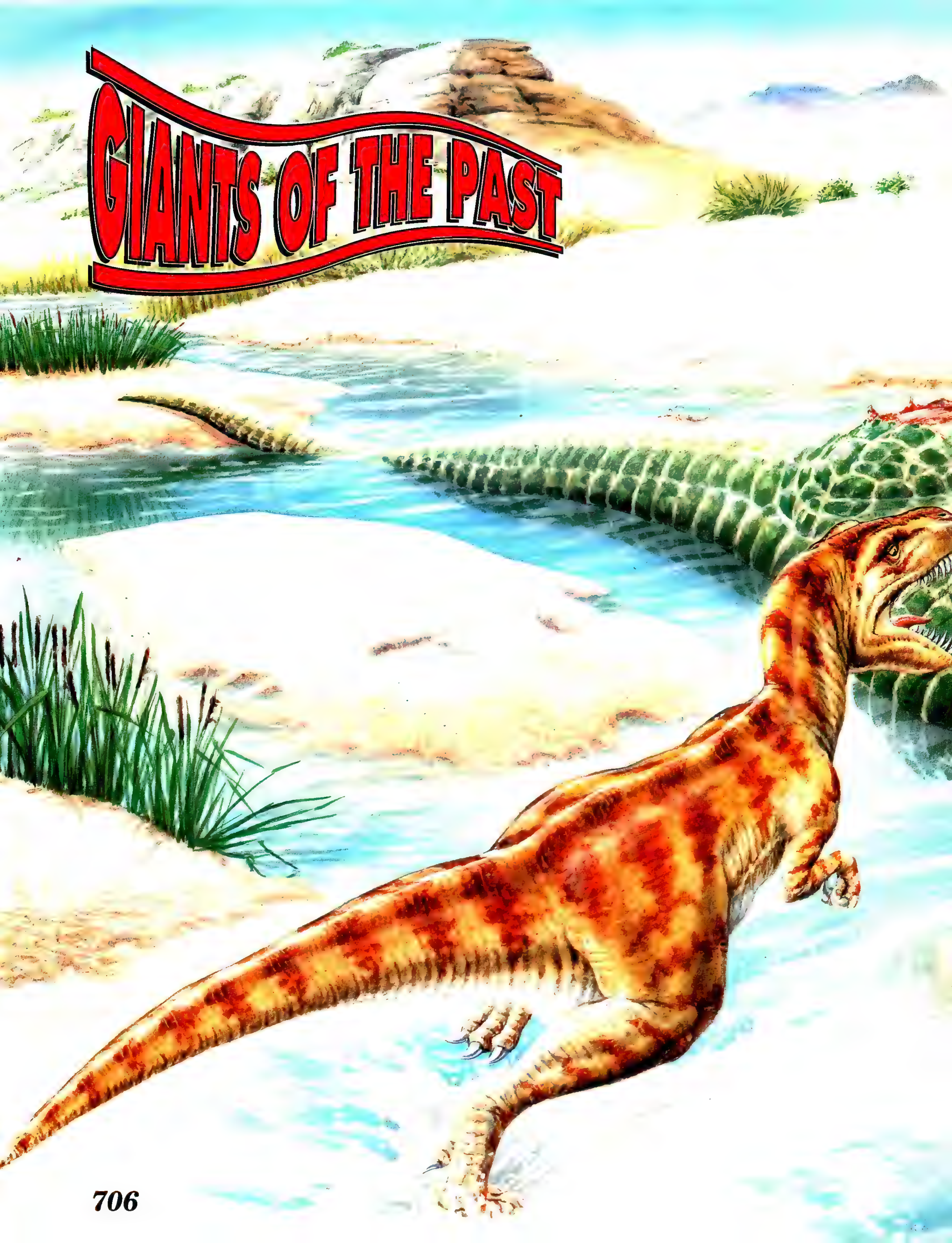
Most dinosaurs were fairly large animals. Their feet were firmly on the ground. There is no good evidence that even the smallest dinosaurs climbed trees. The tiny shrew-like mammals of the Age of the Dinosaurs would have found the trees ideal places to hide. With their warm blood and fur, the mammals could stay active and hunt through the chilly night, as the dinosaurs dozed. They waited in the branches, until the dinosaurs had gone and they could take over.

Today, the red squirrel lives, as its prehistoric mammal ancestors did, high in the branches of pine forests.

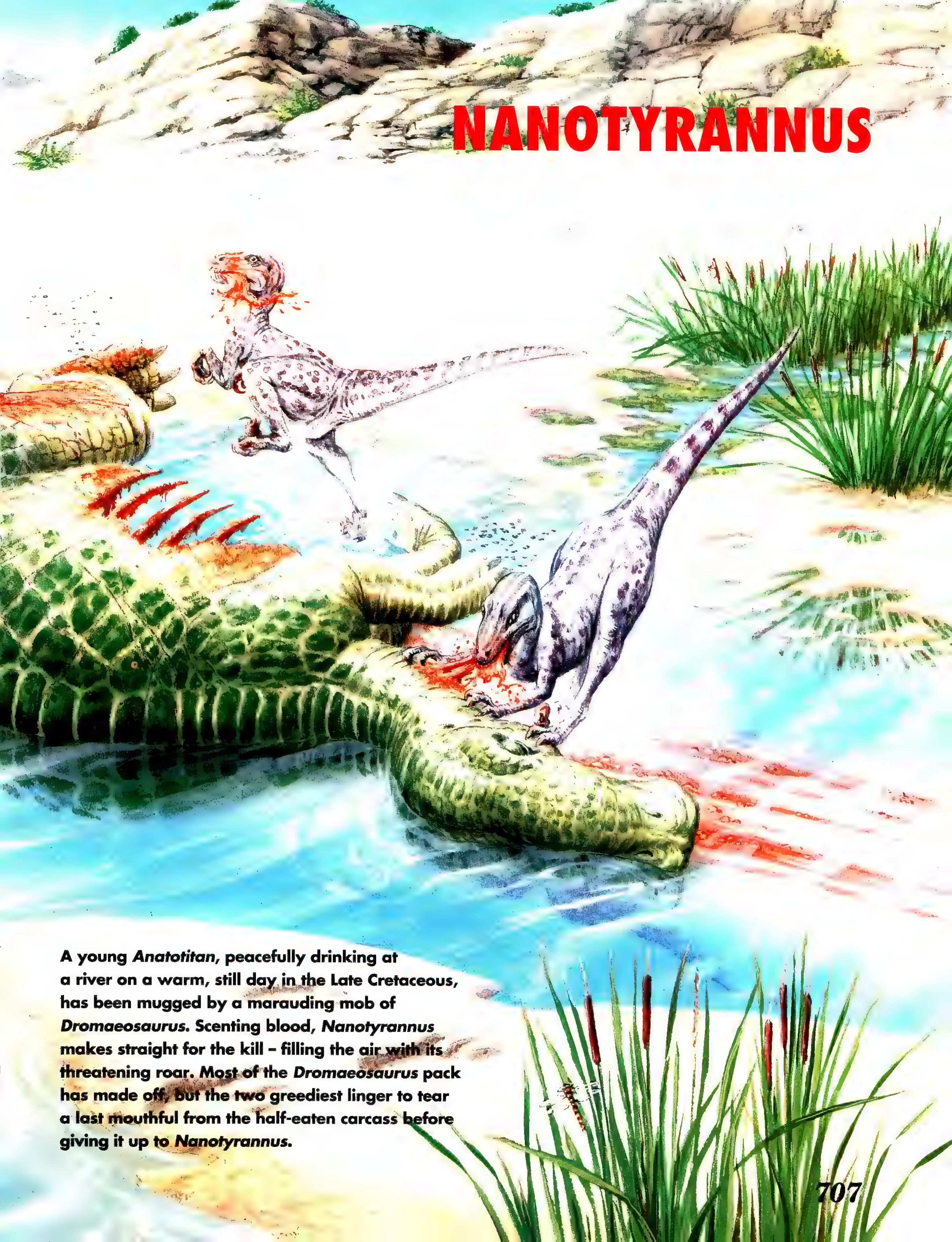
Is it true that animals use colours to communicate?

Many animals communicate using both colours and movements. They use them to send messages such as, 'Be my mate' or, 'Go away or I'll attack!' The American collared lizard uses its bright blue colour to attract a mate. The male green anole lizard has a bright red throat flap, which it opens out to interest its partner. The frilled lizard flashes its bright yellow neck ruff to warn off enemies. The cobra rears up and opens its hood when threatened. These animals are all reptiles, like dinosaurs. So it is possible that some dinosaurs, such as the hadrosaurs, also used colours and movements to communicate.

GIANTS OF THE PAST



NANOTYRANNUS



A young *Anatotitan*, peacefully drinking at a river on a warm, still day in the Late Cretaceous, has been mugged by a marauding mob of *Dromaeosaurus*. Scenting blood, *Nanotyrannus* makes straight for the kill – filling the air with its threatening roar. Most of the *Dromaeosaurus* pack has made off, but the two greediest linger to tear a last mouthful from the half-eaten carcass before giving it up to *Nanotyrannus*.

3-D Gallery

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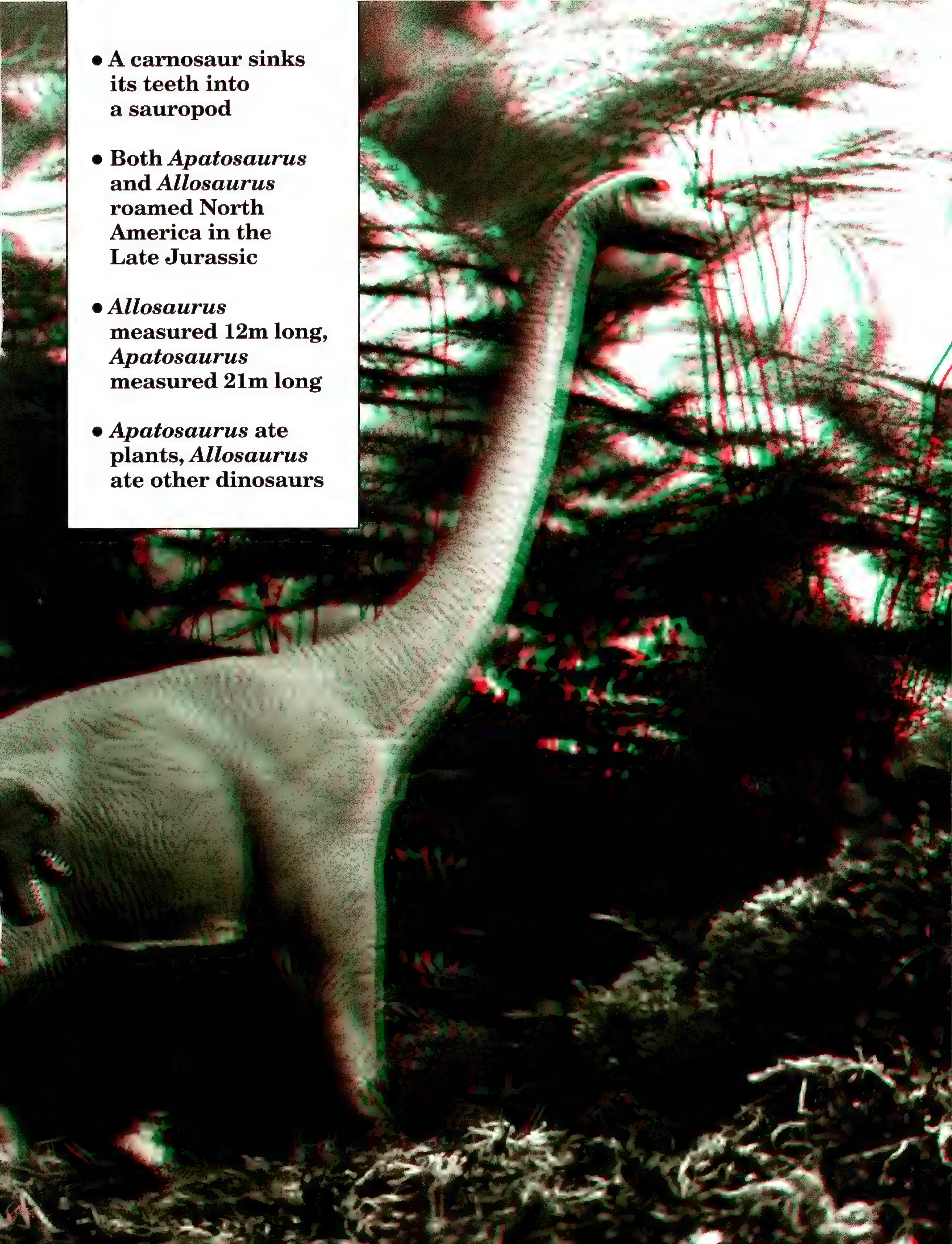
ALLOSAURUS AND APATOSAURUS

- A carnosaur sinks its teeth into a sauropod
- Both *Apatosaurus* and *Allosaurus* roamed North America in the Late Jurassic
- *Allosaurus* measured 12m long, *Apatosaurus* measured 21m long
- *Apatosaurus* ate plants, *Allosaurus* ate other dinosaurs



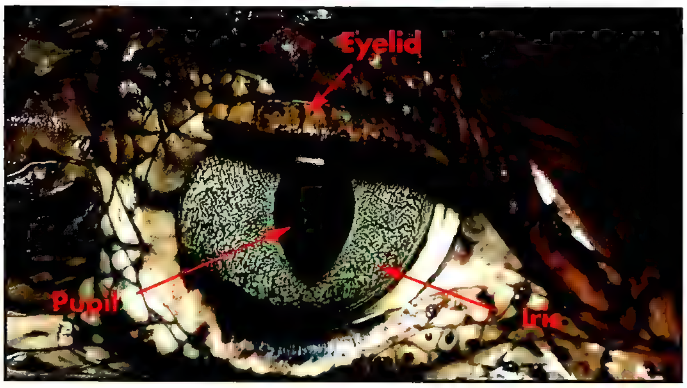
LOOK

Eyes to spot danger. Eyes to spot food. Dinosaurs were always on the look out.

Dinosaurs needed to keep their eyes open. They needed to avoid danger, find their next meal and recognise their own kind, or a mate. Like living birds and reptiles, dinosaurs were sharp-sighted creatures.

BRIGHT EYES

Troodon probably had the best eyesight of any dinosaur. Its eyes were very large. Not only could it see well in daylight, but its large eyes meant that it could see well at night too. *Troodon* made use of its excellent night vision to hunt when it was dark.



This caiman's pupil (above) widens when it gets dark. This lets more light into the eye and helps the caiman to see its night-time prey.

This gecko's pupil (right) is very thin and slit-shaped. During the hours of darkness, it widens to let in more light.

SEEING CLEARLY

The pupils in your eyes are round. When it is dark they get bigger to let in more light. When it is bright sunlight, they get smaller. Today's cats and some living reptiles, such as the nocturnal gecko, have slit-shaped pupils. A dinosaur that could see well in the dark may also have had slit-shaped pupils that widened at night to let in more light.

BONY RINGS

Some dinosaurs had bony rings around their eyes. These rings held the eyeballs and helped to keep the eyes in focus.

***Troodon's* extra-large eyes gave it very good sight. It may have been able to see well enough to hunt in the dark.**

OUT!

HAWK-EYED

Scientists think it is quite possible that some of the large-eyed hunting dinosaurs were as 'hawk-eyed' as modern birds of prey. The peregrine falcon, one of today's birds of prey, has such good eyesight that it can spot a pigeon from 8km away.

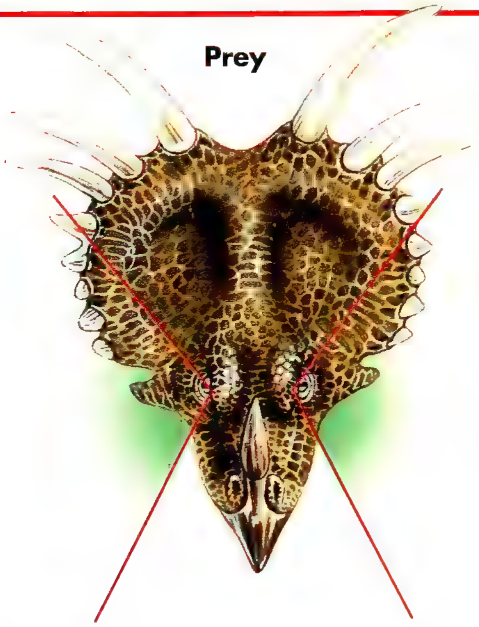
SEEING IN COLOUR

Reptiles and many birds alive today see in colour; perhaps dinosaurs did too. Dinosaurs may have changed colour to attract mates or for camouflage. If they did, it means that dinosaurs must have been able to see colours.

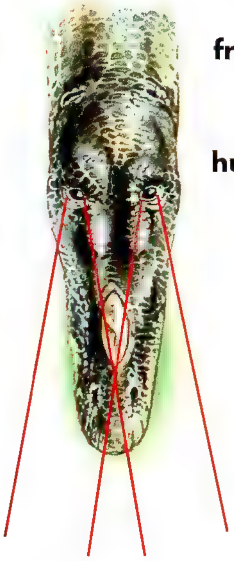
Plant-eater *Styracosaurus* had eyes on the sides of its head. Like the rabbit, it could see all round to spot hunters.

Rabbit

Prey



Predator

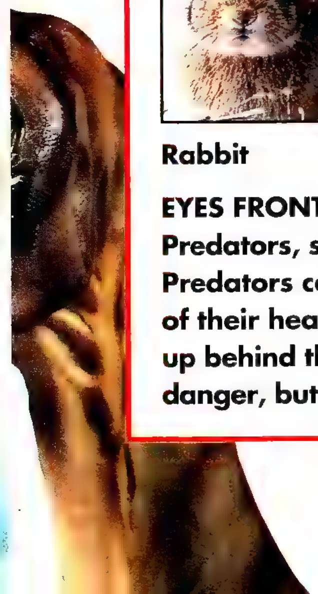


***Ceratosaurus'* eyes (left) were on the front of its head like the eagle owl (below). Both are hunters on the look-out for prey.**

Eagle owl

EYES FRONT OR TO THE SIDE?

Predators, such as cats, owls and humans, have eyes on the front of their heads, facing forwards. Predators can see forwards and a bit to either side. Prey, such as rabbits, have eyes on the sides of their heads. They can see almost all round and can often spot danger, even when it is creeping up behind them. The eyes of plant-eating dinosaurs were on the sides of their heads to watch for danger, but those of predators, like *T rex*, (top of page) usually faced forwards to spot prey easily.



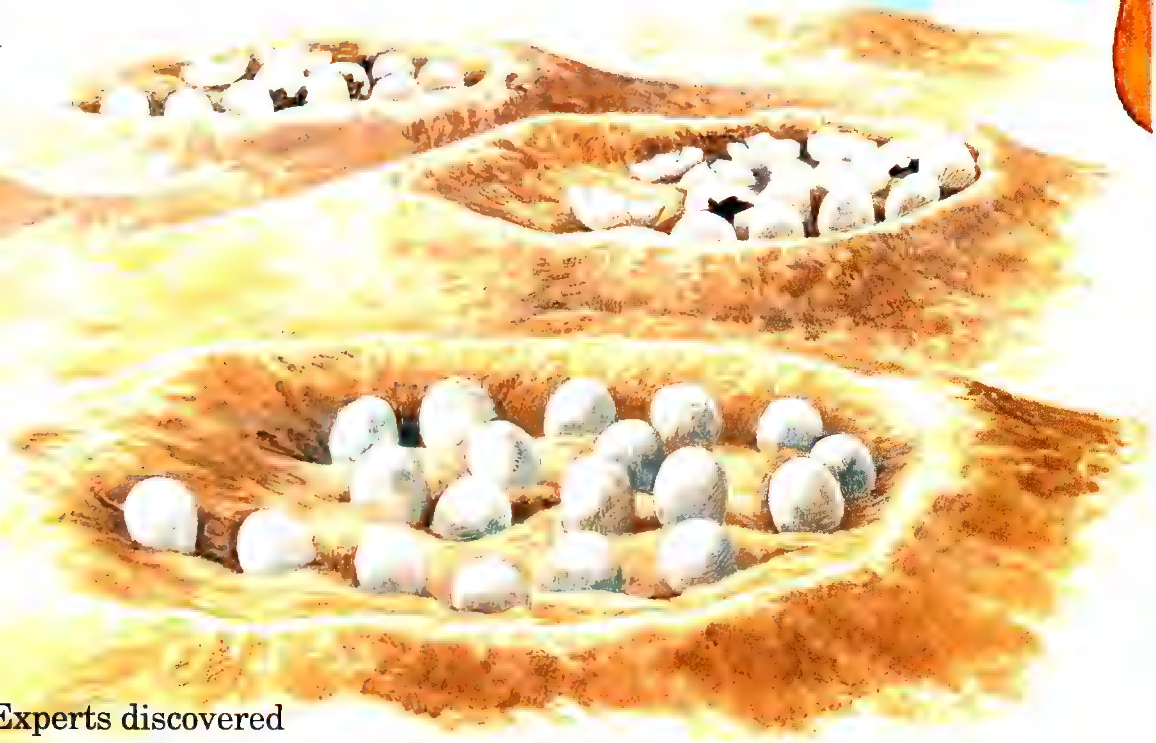
Solving the mystery of Egg Mountain

On a rocky hill in Montana, North America, scientists found so many dinosaur nests that they called the hill Egg Mountain.

Buried in the rock were nests and eggs belonging to an unknown dinosaur. They provided important evidence about how it behaved as a parent. Follow the clues to find out more.

Is it true **that air can pass through eggshells?**

Yes. All eggs have shells that air can travel through to reach the embryo inside. Dinosaur eggshells had rough, bumpy surfaces – the bumps stopped the tiny pores, which let the air through, from getting blocked.



Unlike the dinosaur nests found previously, the fossilized nests found on Egg Mountain (above) contained whole, undamaged eggs laid in the shape of a spiral.

CLUE 1 Experts discovered 10 nests of fossilized dinosaur eggs, which looked very different from any found before. The eggs were smaller. But most important, they had not been trampled on by the young dinosaurs which hatched out of them. So the babies must have left the nest straight away.

CLUE 2

In one nest there were 19 eggs that had not hatched. Scientists used a special X-ray machine to look inside each egg. They were able to see the tiny curled-up embryos that had never hatched. It was the first time embryos had been discovered in fossilized dinosaur eggs.

The fossilized embryos inside the eggs (left) were well developed.

CLUE 3

Scientists found the remains of bones and small skeletons near the nests. They were able to identify the embryos and scattered bones as the remains of a new member of the speedy plant-eating hypsilophodontid family. They called it *Orodromeus,* which means 'mountain runner'. It was only 2.5m long.

***Orodromeus* young (above) were ready to leave the nest as soon as they hatched.**

CRACKED IT!

Scientists decided that *Orodromeus* parents must have left their young to look after themselves. The fact that the *Orodromeus* eggs had not been trampled on after hatching told the experts a great deal. When eggs of *Maiasaura*, the 'good mother lizard', were found in nests, they were smashed because the hatchlings stayed in the nests for some time. The *Orodromeus* embryos had better developed legs and joints. So they didn't stay in the nest and walk over the eggs. Instead, they raced away to find food.

***Orodromeus* (above) returned year after year to the same nest site to lay its eggs.**

Uncaring parents?

Some dinosaur parents looked after their young. Others left their hatchlings to look after themselves.

Experts think that *Orodromeus* young were left to fend for themselves. They might seem to be uncaring parents. But it may have been the best way of helping their hatchlings to survive.

REPTILES TODAY

Modern reptiles, such as tortoises and turtles, also abandon their eggs once they have been laid. Like *Orodromeus*, they dig a hole, lay their eggs, and cover them over to hide them from predators.

QUICK DEVELOPERS

When scientists examined *Orodromeus* embryos in eggs, they discovered that they were very well formed. So when they hatched they could have scuttled out of the nest straight away.

SLOW MOVERS

Fossil embryos of *Maiasaura* are not as well developed. So *Maiasaura* hatchlings were probably looked after in the nest by their parents.

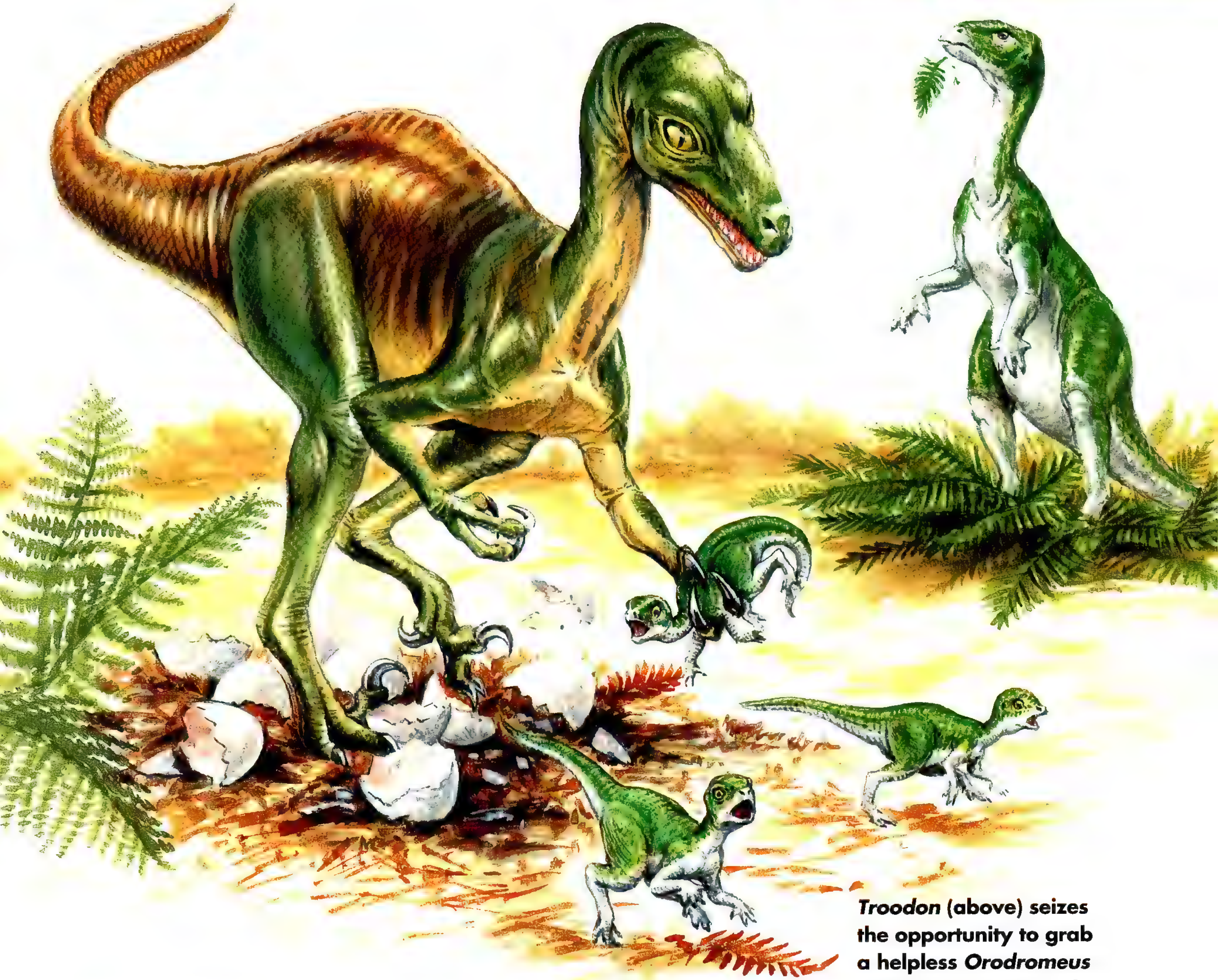
SAFETY IN NUMBERS?

Fossil remains show that *Orodromeus* nested in large colonies. Parents may have watched over their eggs until they hatched. And the sight of so many *Orodromeus* could have frightened smaller enemies away. But the scattered remains of newly hatched and very young *Orodromeus* near the nests shows that parents were unable to drive away large predators.

Today, turtles lay their eggs in sand and abandon them (bottom). The young turtles are well developed when they hatch (centre), and make straight for the sea (top).

SITTING DUCKS

A nest full of hatchlings would be an easy target for hungry meat-eaters. Fossils found in the area around *Orodromeus* nests show that predators lurked nearby.



Troodon **(above) seizes the opportunity to grab a helpless *Orodromeus* hatchling, scattering the other nestlings.**

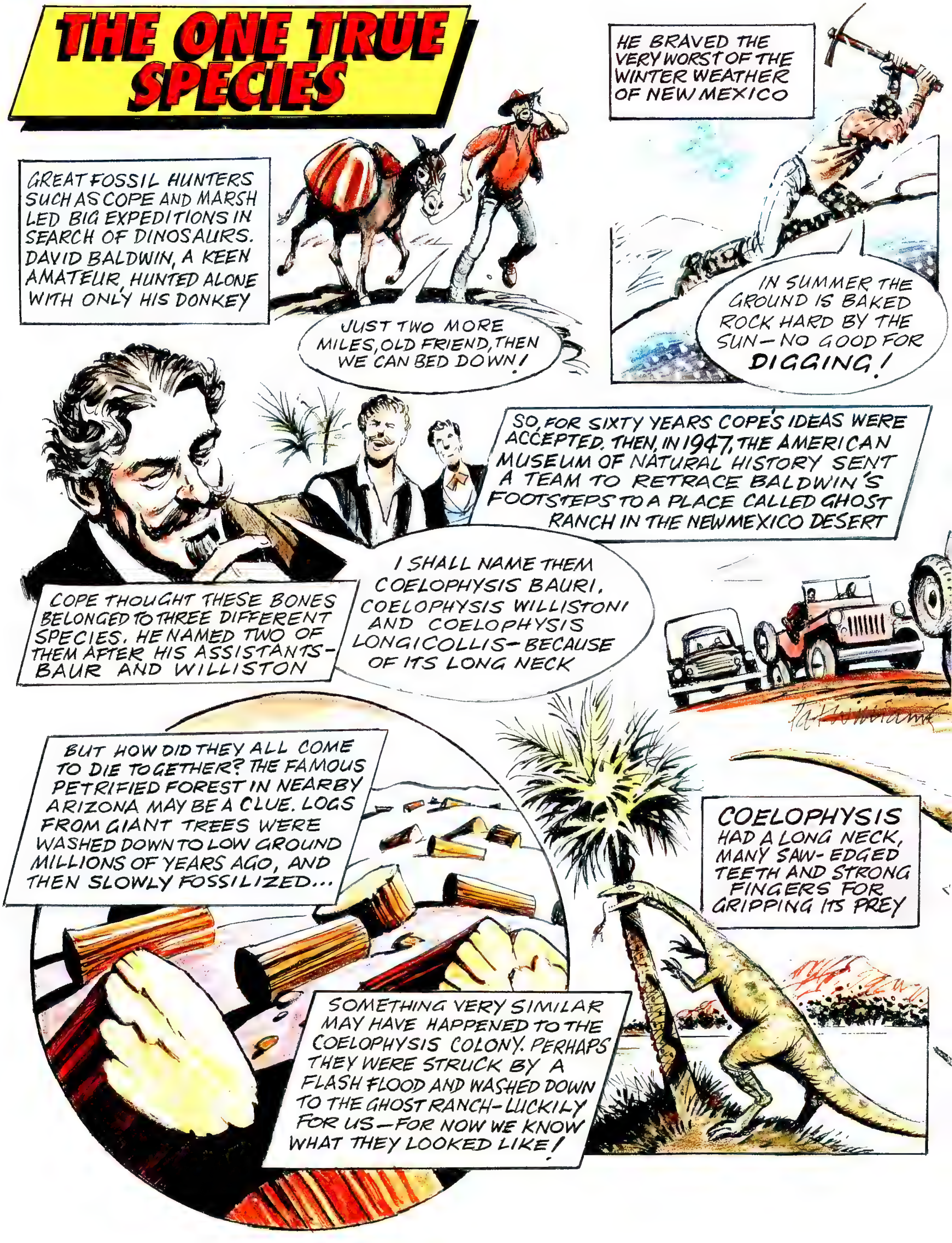
ON THE LOOK OUT

Orodromeus parents had to be on the look-out for nest-raiding *Troodon,* which has been found nearby. The plant-eaters had to keep a watchful eye on their vulnerable eggs. But once the hatchlings left the nest they would be more difficult to spot. So by leaving their young to fend for themselves, *Orodromeus* parents may have helped them to survive. The remains of other predators found near the nests include the teeth of the meat-eater *Albertosaurus.*

ISLAND HOPPING

Orodromeus liked to nest on low-lying islands in broad, shallow lakes. This would make them less easy to attack. Like today's baby turtles, *Orodromeus* hatchlings might have been born with an instinct to run straight into the water. Or perhaps they behaved more like modern ducklings and charged after their mother into the safety of the shallows.

THE ONE TRUE SPECIES



GREAT FOSSIL HUNTERS SUCH AS COPE AND MARSH LED BIG EXPEDITIONS IN SEARCH OF DINOSAURS. DAVID BALDWIN, A KEEN AMATEUR, HUNTED ALONE WITH ONLY HIS DONKEY

JUST TWO MORE MILES, OLD FRIEND, THEN WE CAN BED DOWN!

HE BRAVED THE VERY WORST OF THE WINTER WEATHER OF NEW MEXICO

IN SUMMER THE GROUND IS BAKED ROCK HARD BY THE SUN — NO GOOD FOR DIGGING!

COPE THOUGHT THESE BONES BELONGED TO THREE DIFFERENT SPECIES. HE NAMED TWO OF THEM AFTER HIS ASSISTANTS — BAUR AND WILLISTON

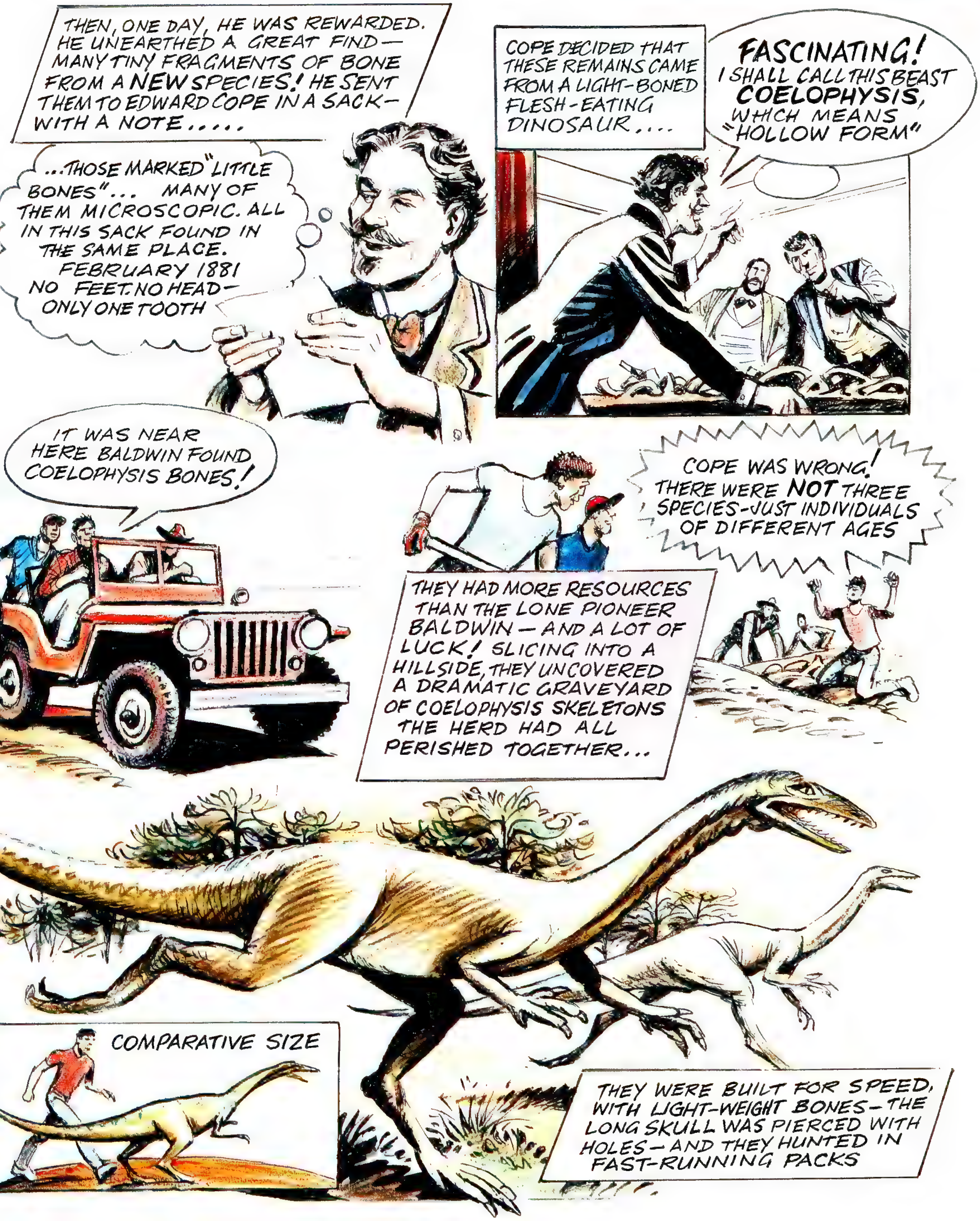
I SHALL NAME THEM COELOPHYSIS BAURI, COELOPHYSIS WILLISTONI AND COELOPHYSIS LONGICOLLIS — BECAUSE OF ITS LONG NECK

SO, FOR SIXTY YEARS COPE'S IDEAS WERE ACCEPTED. THEN, IN 1947, THE AMERICAN MUSEUM OF NATURAL HISTORY SENT A TEAM TO RETRACE BALDWIN'S FOOTSTEPS TO A PLACE CALLED GHOST RANCH IN THE NEW MEXICO DESERT

BUT HOW DID THEY ALL COME TO DIE TOGETHER? THE FAMOUS PETRIFIED FOREST IN NEARBY ARIZONA MAY BE A CLUE. LOGS FROM GIANT TREES WERE WASHED DOWN TO LOW GROUND MILLIONS OF YEARS AGO, AND THEN SLOWLY FOSSILIZED...

SOMETHING VERY SIMILAR MAY HAVE HAPPENED TO THE COELOPHYSIS COLONY. PERHAPS THEY WERE STRUCK BY A FLASH FLOOD AND WASHED DOWN TO THE GHOST RANCH — LUCKILY FOR US — FOR NOW WE KNOW WHAT THEY LOOKED LIKE!

COELOPHYSIS HAD A LONG NECK, MANY SAW-EDGED TEETH AND STRONG FINGERS FOR GRIPPING ITS PREY


THEN, ONE DAY, HE WAS REWARDED. HE UNEARTHED A GREAT FIND — MANY TINY FRAGMENTS OF BONE FROM A NEW SPECIES! HE SENT THEM TO EDWARD COPE IN A SACK — WITH A NOTE.....
...THOSE MARKED "LITTLE BONES"... MANY OF THEM MICROSCOPIC. ALL IN THIS SACK FOUND IN THE SAME PLACE. FEBRUARY 1881 NO FEET. NO HEAD — ONLY ONE TOOTH
COPE DECIDED THAT THESE REMAINS CAME FROM A LIGHT-BONED FLESH-EATING DINOSAUR....
FASCINATING! I SHALL CALL THIS BEAST COELOPHYSIS, WHICH MEANS "HOLLOW FORM"
IT WAS NEAR HERE BALDWIN FOUND COELOPHYSIS BONES!
COPE WAS WRONG! THERE WERE NOT THREE SPECIES — JUST INDIVIDUALS OF DIFFERENT AGES
THEY HAD MORE RESOURCES THAN THE LONE PIONEER BALDWIN — AND A LOT OF LUCK! SLICING INTO A HILLSIDE, THEY UNCOVERED A DRAMATIC GRAVEYARD OF COELOPHYSIS SKELETONS THE HERD HAD ALL PERISHED TOGETHER...
COMPARATIVE SIZE
THEY WERE BUILT FOR SPEED, WITH LIGHT-WEIGHT BONES — THE LONG SKULL WAS PIERCED WITH HOLES — AND THEY HUNTED IN FAST-RUNNING PACKS

Improve and test your knowledge with...

DINO Fact File

Follow the footprints to complete the quiz and get to the bottom of the question mark!

1 *Nanotyrannus'* largest cousin was:

- a) *Diplodocus*
- b) *T rex*
- c) *Hadrosaurus*

2 Which dinosaur did not live in the Late Cretaceous?

- a) *Nanotyrannus*
- b) *Triceratops*
- c) *Jaxartosaurus*

Hour after hour

Have you ever heard the saying 'there are never enough hours in the day'? During the Triassic Period the days were shorter – each day only lasted about 23 hours!

6 What was found in *Corythosaurus'* stomach?

- a) a small mammal
- b) some pine needles
- c) another dinosaur

7 How much bigger than *Allosaurus* was *Apatosaurus*?

- a) 9m
- b) 15m
- c) 1m

8 *Melanorosaurus* means:

- a) melon head reptile
- b) melanoma reptile
- c) black mountain reptile

9 *Styracosaurus* had eyes:

- a) on the front of its head
- b) on top of its head
- c) on the sides of its head

Solid bone

Fossils of dinosaur skulls are rare compared with fossils of other parts of their skeletons. This is because the skulls are made up of fragile bony struts which are easily broken during fossilization. However, many skulls of Triceratops have been found in almost perfect condition, as these skulls were just one massive chunk of solid bone.

10 Which dinosaur embryos were found at Egg Mountain?

- a) *Troodon*
- b) *Oviraptor*
- c) *Orodromeus*

Time for a change

Evolution means change and improvement from a simple beginning. All creatures, including dinosaurs, evolved from the very first living organisms (probably blue-green algae and bacteria) 3,500 million years ago.

3 What did *Jaxartosaurus* use its crest for?
a) digging for food
b) head butting
c) a warning signal

4 Which family of dinosaurs are the heaviest and the tallest?
a) theropods
b) sauropods
c) carnosaurs

5 Which of these dinosaurs had the longest neck?
a) *Barosaurus*
b) *Brachiosaurus*
c) *Dicraeosaurus*

Brain game

The most famous rivalry in palaeontology was between Edward Cope and Othniel Marsh. During the late 1800s, the scientists raced each other to discover and name new dinosaurs. Cope was so sure he was the better scientist that in his will he asked for his brain to be measured. He wanted to show the world that he was more intelligent than his bitter rival, Marsh. But when Marsh died two years later his brain was not measured. To this day, Cope's skull is displayed in a museum in Philadelphia, USA.

A changing world

If you could have flown around the Earth in a satellite 180 million years ago, you would have seen a world quite different from the one we know. Half of the world – the massive ocean called Panthalassa – would have looked totally blue. Zooming around the other side, you would have seen the yellows and browns of the supercontinent Pangaea.

Keeping cool

How did small, plant-eating Scutellosaurus keep cool in the hot summers of the Early Jurassic? It probably sheltered in burrows during the heat of the day.

Answers to the questions on inside back cover

MELANOROSAURUS **210 MYA**

The largest of the early dinosaurs, *Melanorosaurus* (mel-an-oro-saw-rus) was as long as three cars. This large plant-eater lived in the Late Triassic Period in South Africa. No skull has yet been found, but *Melanorosaurus* is known to have had a long neck and tail. It probably walked on all four elephant-like legs. *Melanorosaurus* means 'black mountain reptile'.

MICROCERATOPS **75 MYA**

Microceratops (my-kro-ser-a-tops) means 'tiny horned face'. This little dinosaur was only 76cm long, about the size of a small beaver. It had a horny beak for snapping off shoots, and a small neck frill. *Microceratops* had quite long legs for its size and could run fast on its slender hind limbs. It lived in China in the Late Cretaceous Period.

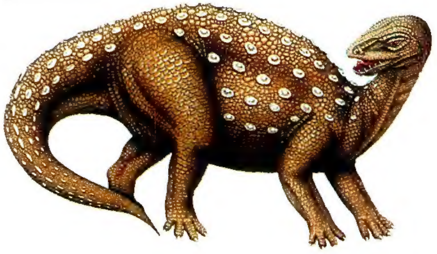
MYA = MILLION YEARS AGO

MICROPACHYCEPHALOSAURUS **75 MYA**

In spite of its extremely long name, *Micropachycephalosaurus* (my-kro-pak-ee-kef-al-oh-saw-rus) was one of the tiniest dinosaurs. It was no bigger than a rabbit. Its name means 'tiny thick-headed reptile'. *Micropachycephalosaurus* had a flat, dome-shaped skull. It ate plants and walked on two legs.

MINMI **130 MYA**

Minmi (min-mee) was named after Minmi Crossing in Queensland, Australia, where parts of its back and foot were found. Experts think that *Minmi's* backbones were arranged to enable it to run fast. *Minmi* is the only known Australian ankylosaur and it was probably covered all over in small bony armour plates. It was about 2m long and the height of an adult human's knee.

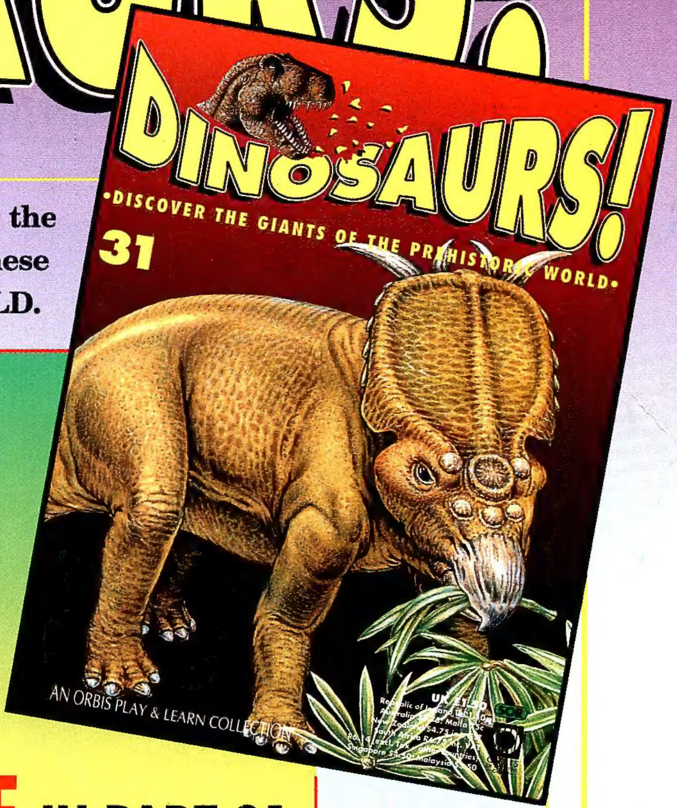


MONKONOSAURUS **130 MYA**

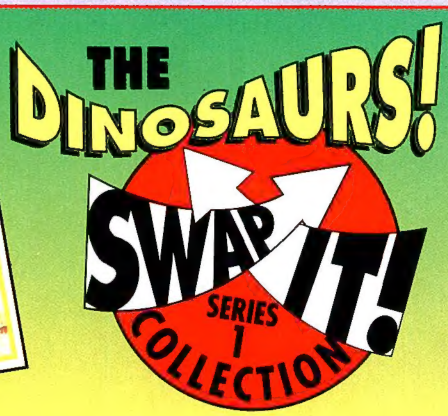
Monkonosaurus (mun-koh-no-saw-rus) lived in the Early Cretaceous Period in Tibet. This stegosaur was well-protected from its enemies with a double row of armour plates along its back and neck. Long, sharp spines stood out from its tail and shoulders. *Monkonosaurus* stood on four legs and browsed among low-growing plants. Its name means 'Monko lizard'.

COMING IN PART 31 OF

DINOSAURS!


DINOSAURS!
•DISCOVER THE GIANTS OF THE PREHISTORIC WORLD•
31
AN ORBIS PLAY & LEARN COLLECTION

Flick through IDENTIKIT to meet *Pachyrhinosaurus*, the dinosaur without a nose horn. Discover the Chinese dinosaurs in DINOSAUR WORLD.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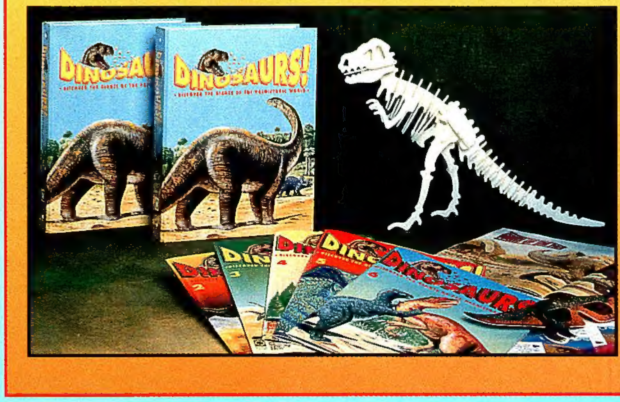

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ANSWERS TO DINO FACT FILE QUESTIONS: 1.b 2.c 3.c 4.b 5.b 6.b 7.a 8.c 9.c 10.c

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Dr. David Norman of Cambridge University answers your dinosaur questions

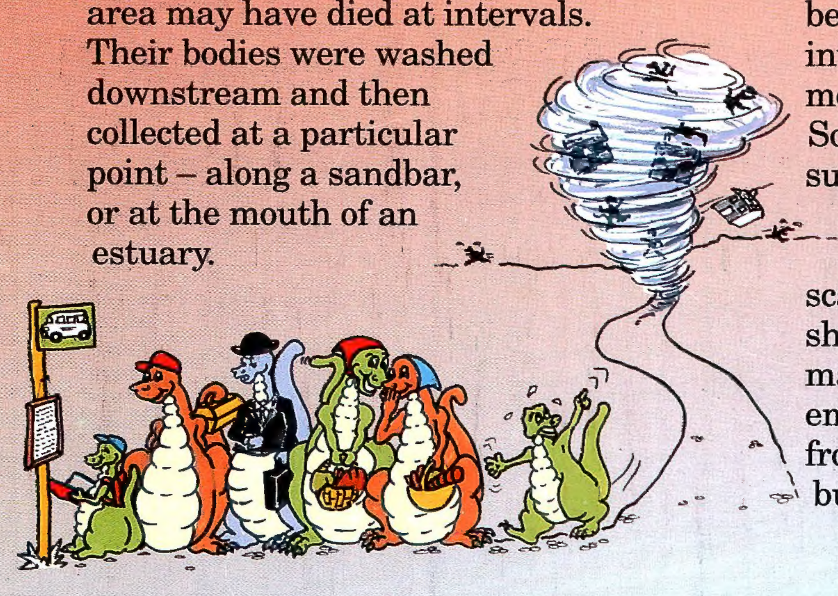
ASK THE EXPERT

Did dinosaurs mate for life?

No one knows. Some scientists have suggested that some dinosaurs lived like birds and therefore may have been similar to swans, which do mate for life. But this is pure speculation. I think that mating for life would have happened rarely, if ever.

Why are dinosaur fossils sometimes found all in one place?

The dinosaurs may have all died together in a natural disaster. For example, a herd of dinosaurs crossing a river in flood may have been swept downstream, drowned, washed up on a sandbank and then buried under silt. Millions of years later palaeontologists discovered them. Alternatively, dinosaurs living in one area may have died at intervals. Their bodies were washed downstream and then collected at a particular point – along a sandbar, or at the mouth of an estuary.



What did dinosaurs do when they could not find their own food?

Unfortunately they would have died. The laws of nature are very strict. If dinosaurs became old and infirm or unable to look after themselves, they would have either have died of hunger or thirst, or would have been picked off by predators. It is just the same in the wild today – old or sick wildebeest fall prey to lions or hyenas.

Could dinosaurs see in the dark?

Some dinosaurs such as *Troodon* and *Ornithomimus* had very large, saucer-like eyes, and seem to have been highly intelligent, fast-moving creatures. Some scientists have suggested that these dinosaurs were able to feed at dusk, using their sharp eyes and dextrous hands to catch little scampering shrew-like mammals emerging from their burrows.

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